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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/776,228	02/12/2004	Je Won Kim	2336-241	2636

7590 02/09/2005

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EXAMINER

MULPURI, SAVITRI

ART UNIT	PAPER NUMBER
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2812

DATE MAILED: 02/09/2005

Please find below and/or attached an Office communication concerning this application or proceeding.

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Office Action Summary	Application No.	Applicant(s)	
	10/776,228	KIM ET AL.	
	Examiner	Art Unit	
	Savitri Mulpuri	2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE ____ MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 12 February 2004.
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-10 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- * See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____ |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date <u>1/12/2004</u> . | 6) <input type="checkbox"/> Other: ____ |

DETAILED ACTION

Priority

Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

Claim Rejections - 35 USC § 112

Claim 8 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. It is not understood how step C) further comprises heat-treating process on the nitride semiconductor film, after completing the step C).

Clarification requested.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1-4, 7, 10 are rejected under 35 U.S.C. 102(e) as being anticipated by

Orita et al (US 6,673,702)

Orita et al teaches growing GaN buffer layer on either sapphire substrate;

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treating the buffer layer in hydrogen atmosphere (see col. 4, lines 39-47; col. 7, lines 1-30); successively growing first GaN based layer, active GaN based layer and second GaN based layer on the buffer layer (see 7C). Orita et al also teaches growing first active and second GaN based layers in MOVPE or HVPE.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 5,6,8, 9 are rejected under 35 U.S.C. 103(a) as being unpatentable over Orita et al in combination with Nakamura et al.

With respect to claim 5 nitridation is performed on the sapphire substrate. Though Orita et al teaches both HVPE and MOCVD for both buffer layer and active layers, Orita et al does not teach specifically which layer is grown by what technique. However, it is well known that HVPE give fast growth rate with low quality GaN layer and MOCVD give low growth rate and high quality and it is obvious to one of the ordinary skill in the art to grow buffer layer in HVPE at fast growth to get thick buffer layer and active layer in MOCVD with slow growth rate and thin layers for light emission. Using thick layer is essential as buffer layer because thick layer are useful not to cause any defects in the subsequent device

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layers. Orita et al does not additionally teach heat-treating step. Acura et al teaches heat-treating technique. (see page 4, lines 0060-0061). It would have been obvious to one of ordinary skill in the art to perform heat treatment of the GaN layers because heat treatment for the benefit of to increase the dopant activity in the GaN layer.

Claims 1-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee et al (US 6,528,394) in combination with Orita et al (US 6,673,702).

Lee et al teaches growing low-temperature GaN buffer layer on either sapphire or SiC substrate (see col.1, line35-37; and successively growing first GaN based layer, active GaN based layer and second GaN based layer on the buffer layer. In the background invention, Lee et al specifically mention growing GaN buffer layer is viable option because of the high growth rate in HVPE technique, which supports the instant claim 5. Lee et al also teaches growing first active and second GaN based layers in MOVPE (same as MOCVD) and such layers must be high quality layers because MOVPE is slow growth rate technique and produces layers with mirror surface layers for light emission (see col. 1, lines 14-52). With respect to claim 5 nitridation "S2 is performed on the sapphire substrate (see fig. 1 and admitted prior art). Lee teaches GaN layer with 2 microns (see 59).

Lee et al do not teach treating the buffer layer in pure hydrogen gas or hydrogen gas mixed with other gases, at temperature of 800 C, to remove oxide layer in MOCVD, and further heat treating process after treating the buffer layer in hydrogen atmosphere.

Orita et al teaches treating the buffer layer in pure hydrogen gas or hydrogen gas mixed with other gases in MOCVD, at temperature of 500- 900 C, to remove oxide layer (see col. 4, lines 39-47; col. 7, lines 1-30).

It would have been obvious to one of ordinary skill in the art to treating the buffer layer in the invention of Lee et al in hydrogen as suggested by Orita et al because such process step would give laser with high efficiency because hydrogen treatment would eliminate oxide and other impurities as mentioned Orita et al.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Wang et al (US 2004/0121085) teaches heat treating the silicon nitride in hydrogen radicals. Terashima et al (6,828,169) teaches treating the BP buffer layer with hydrogen for making GaN based devices. Tsuchida et al (US 2003/0153168) teaches treating the GaN based layer in hydrogen atmosphere (see page 2, para 0029-000036).

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Savitri Mulpuri whose telephone number is 571-272-1677. The examiner can normally be reached on Mon-Fri from 8 a.m. to 4.30 p.m. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Lebentritt, can be reached on 571-272-1873. The fax phone

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number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

A handwritten signature in black ink, appearing to read 'Savitri Mulpuri', with a stylized, flowing script.

Savitri Mulpuri
Primary Examiner
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